

FIG. 1

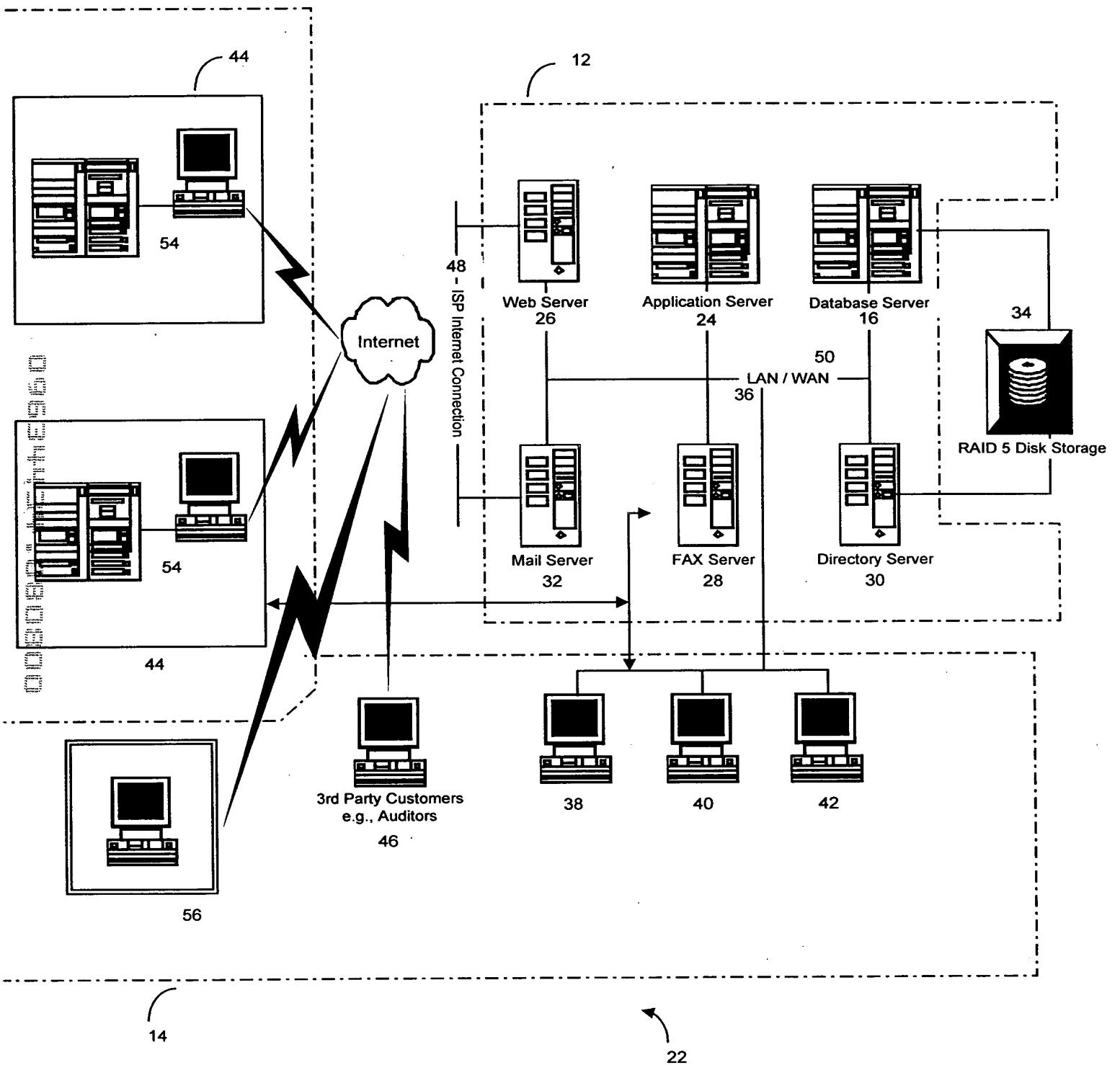
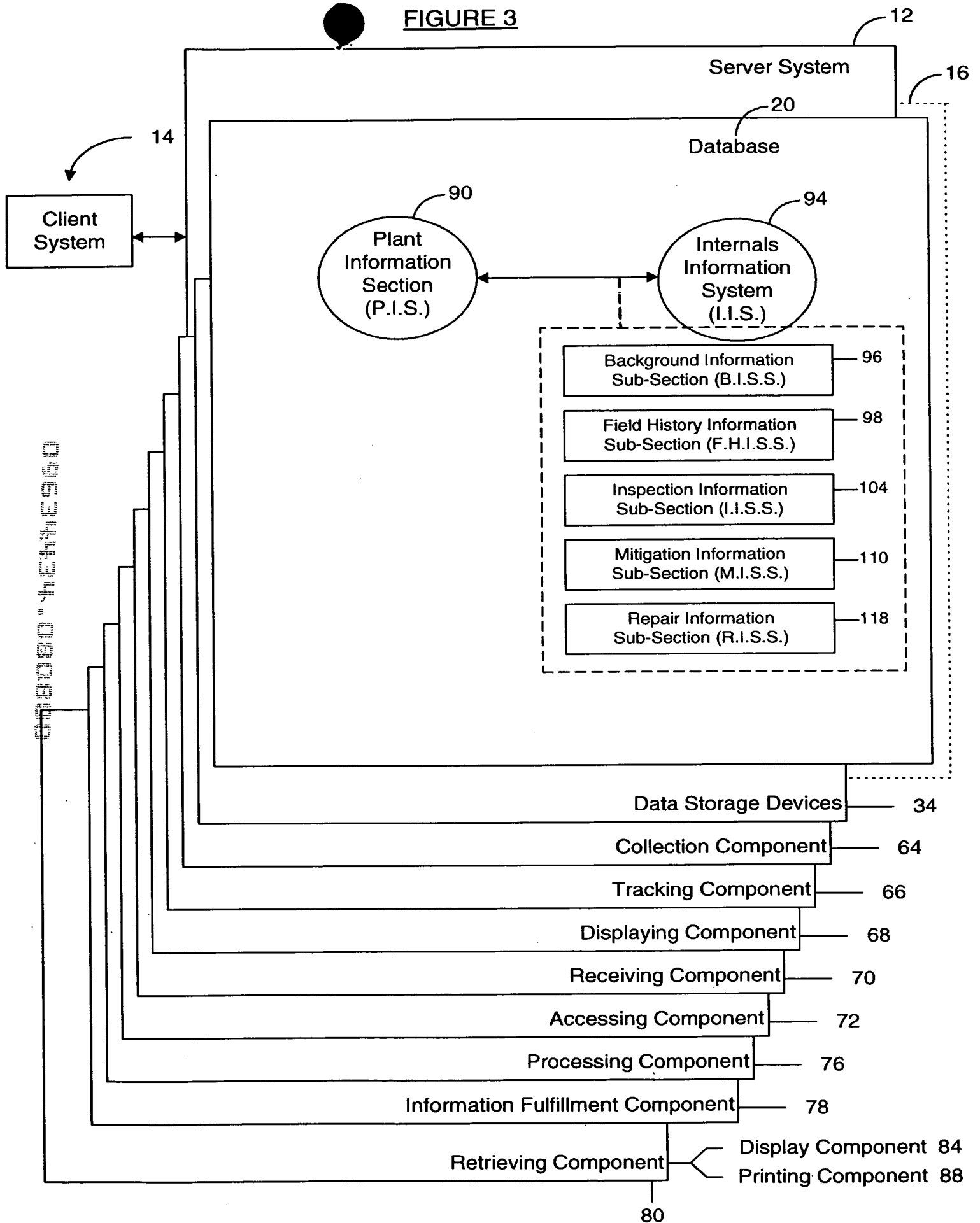


FIGURE 2

FIGURE 3



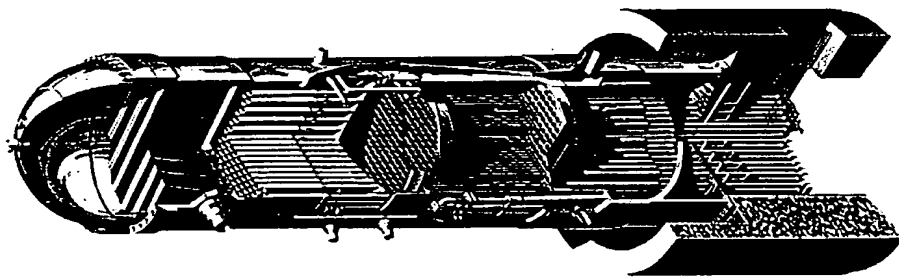


Asset Management

Welcome to the Asset Management Program.

Please choose one of the following plants:

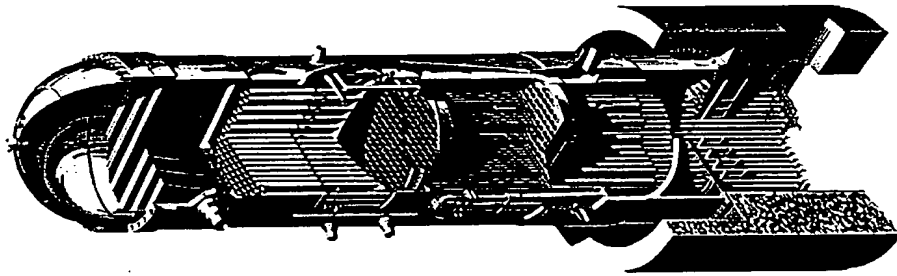
- Dresden 2³¹⁰
- Dresden 3³¹²
- LaSalle 1³¹⁶
- LaSalle 2³²⁰
- Quad Cities 1³²⁴
- Quad Cities 2³²⁸



300 FIGURE - 4

You have chosen to review the Dresden 2 Asset Management Program.

Please choose one of the following internal components:

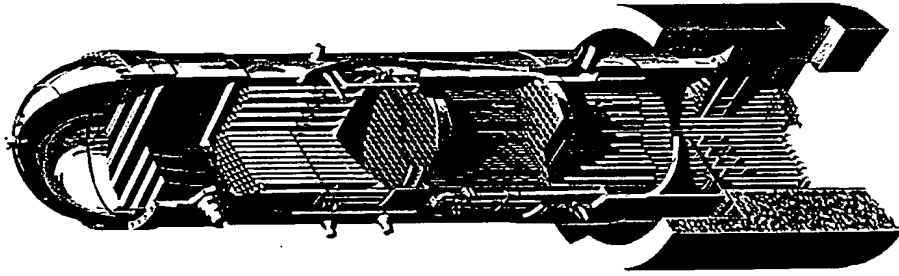


- Core Spray Internal Piping ³⁴⁴
- Core Spray Sparger ³⁵⁰
- Lower Plenum - 354
- Shroud - 356 ³⁵⁸
- Shroud Support & Access Hole Cover ³⁶⁰
- Jet Pump Diffuser - 364
- Jet Pump Riser & Riser Brace ³⁶⁸ ³⁷⁰
- Jet Pump Inlet Mixer - 374
- Jet Pump Sensing Line - 378
- Top Guide - 380
- Core Plate - 384

340 FIGURE - 5

You have chosen to review the La Salle 1
Asset Management Program.

Please choose one of the following internal
components:



- | | |
|--|-----|
| •Core Spray Internal Piping | 404 |
| •Core Spray Sparger- 410 | |
| •Lower Plenum - 414 | |
| •Shroud - 416 | |
| •Shroud Support & Access
Hole Cover | 418 |
| •Jet Pump Diffuser - 424 | |
| •Jet Pump Riser & Riser
Brace | 428 |
| •Jet Pump Inlet Mixer - 434 | 430 |
| •Jet Pump Sensing Line - 438 | |
| •LPCI - 440 | |
| •Top Guide - 442 | |
| •Core Plate- 444 | |

400 FIGURE - 6

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

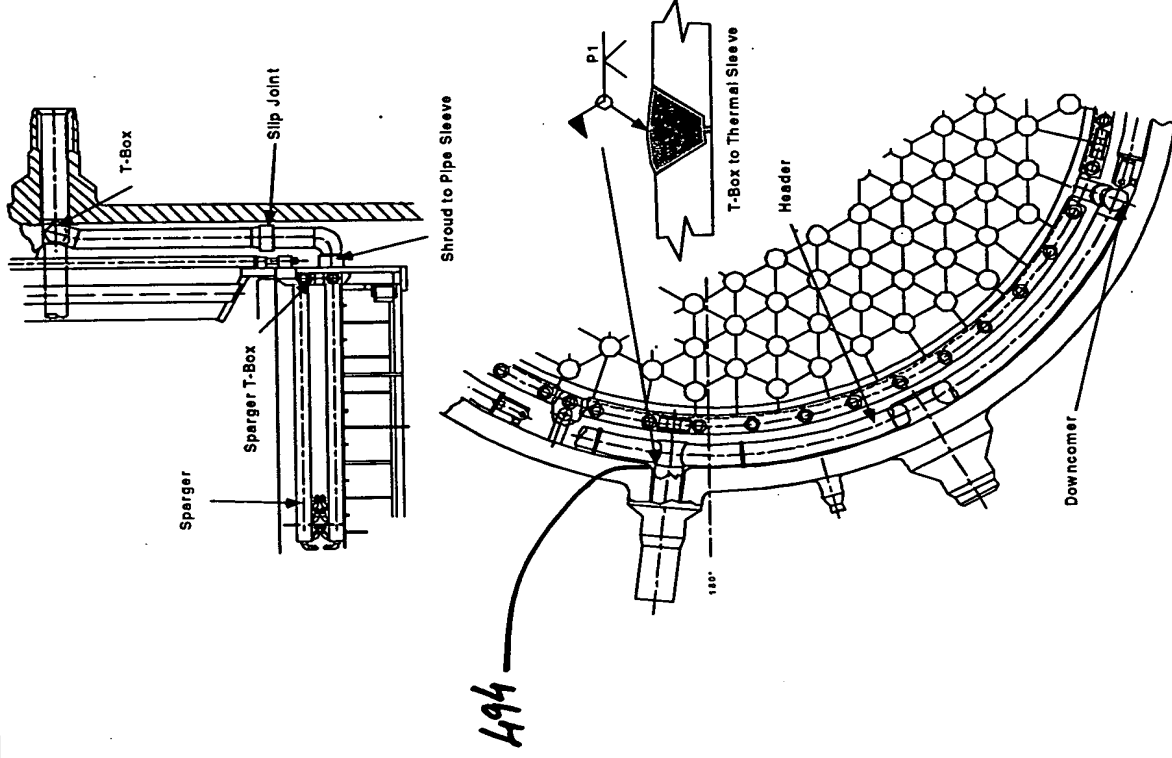
Mitigation

- Methods

Repair

- Methods

Back to AM Home Page



Core Spray Internal Piping

490 (

FIGURE - 8

There will be an active link on the weld callouts which takes the user to a table which gives a description of the weld and the susceptibility of the weld

The user can navigate to any of X figures having to do with this component. The current figure will be highlighted.

Figure 1 2 3 ... X

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

Weld ID	Weld Description	Base Material	Filler Material	Susceptibility # (1 = Low; 5 = High)
P1	Thermal sleeve to T-box (field weld)	T-box: 304 SST Unit 2 Thermal Sleeve 304L SST Unit 3 Thermal Sleeve 304 SST	ER308 or, ER308L	3
P2	T-box cover to T-box (field weld with a creviced root)	T-box: 304 SST T-box Plug: 304 SST	ER308 or, ER308L	4
P3	Pipe to T-box (unfavorable weld geometry, installation cold spring likely)	Pipe: 304 SST T-box: 304 SST	ER308 or, ER308L	3
P4a, b, c, d	Elbow to pipe welds (P4c & P4c shop, other field)	Elbow: 304 SST Pipe: 304 SST	Field welds SST filler of an unknown specification; shop welds ER308 or, ER308L	3
NA	Core spray line bracket to RPV weld	Core Spray Bracket: 304 SST RPV: SST clad low alloy steel	SST filler of an unknown specification	1 (no fleet failures in RPV brackets)
NA	Core spray clamp tack welds.	Core Spray Clamp: 304 SST Bolt: 304 or 316 SST	SST filler of an unknown specification	2 (cracking unlikely to affect function)
P5	Connecting Sleeve to Downcomer Pipe (field weld with a creviced root)	Connecting Sleeve: 304 SST Pipe: 304 SST	SST filler of an unknown specification	5
P6	Connecting Sleeve to Riser Coupling (field weld with a creviced root)	Connecting Sleeve: 304 SST Riser Coupling: 304 SST	SST filler of an unknown specification	5
P7	Riser Coupling to Riser Pipe (shop weld with a creviced root)	Riser Coupling: 304 SST Riser Pipe (shop weld with a creviced root)	ER308 or, ER308L	5
P8a	Collar to Pipe (shop weld)	Collar: 304 Pipe: 304	ER308 or, ER308L	5
P8b	Collar to Shroud (shop weld, unfavorable weld geometry)	Collar: 304 Shroud: 304	ER308 or, ER308L	4
P9	Core spray line pipe to core spray sparger (shop weld)	Pipes: 304	ER308 or, ER308L	4

FIGURE - 9

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

Plant	Prod Line	Com Qtr	Finding	Description	Cause	Repair
BRU2	BWR/4	Nov-75	Jun-78	Crack at upper elbow weld to horizontal header pipe [P4a]	IGSCC	Initially welded followed by replacement of upper piping
OCY1	BWR/2	Dec-69	Jun-80	Two visual indications, 4.5" long and 3" long on 6x5 eccentric reducer @ approx 60 deg RPV azimuth	unknown	None?
PEB3	BWR/4	Dec-75	Oct-85	Cracks (approx 180 degrees) in 6 inch laterals on both sides of 240 degree tee box junction [P3]	IGSCC	Two brackets welded to pipes and tee box
BRU2	BWR/4	Nov-75	Jan-88	Crack in pipe (1978 replacement) at tee box junction [P3]	IGSCC / cold work suspected	Brackets welded to pipes at tee box underwater by divers
FIT1	BWR/4	Jul-75	Oct-88	180 deg crack at a weld in 190 deg vertical downcomer pipe. Weld approx 4" below pipe to elbow weld [an extra weld]	IGSCC	Split pipe coupling welded above and below crack
BRF3	BWR/4	Mar-77	Oct-91	Crack in pipe at tee box junction [P3]	IGSCC	Brackets welded to pipes at tee box underwater by divers
MON1	BWR/3	Jul-71	Jan-93	Crack in pipe at 90 deg tee box junction [P3]	IGSCC	JCO 1 cycle. Bolted repair installed by divers '94 on both tee boxes
BRU1	BWR/4	Mar-77	Jul-93	Crack in weld located 12 inches from tee box junction (extra weld by fabricator)	IGSCC	None
PEB3	BWR/4	Dec-75	Oct-93	HAZ crack (initially reported 3" long) in sleeve connection in vertical pipe; '95 UT found cracks in all 4 downcomers up to 17.5" long [P5 -P7]	IGSCC	JCO in 10/93, Gamps installed at all downcomers in '95
QUA1	BWR/3	Aug-72	Apr-94	120 deg crack in pipe at tee box junction [P3]	IGSCC	None - mechanical clamp to be installed next outage (2-96)
DRE3	BWR/3	Mar-71	May-94	Cracking in vertical pipe near lower elbows at azimuths 110 and 290 [P4c]	IGSCC	Bolted clamp at sparger elbow - 11 on each loop

FIGURE - 10

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

560

For early detection of IGSCC initiated from the inside of core spray welds, which is the most likely initiation point for the creviced downcomer coupling welds (P5, P6 and P7), inspection must be by UT. Many plants are operating indefinitely under an analytical justification with periodic reinspection of known flaws. Accurate sizing is critical for the analytical evaluation of core spray cracks. The tight cracking often seen in internal core spray welds makes UT the preferred inspection method for accurate sizing. BWRVIP-18 also allows longer reinspection intervals and reduced inspection scope with UT. Two recent developments in UT have made inspection of internal core spray piping by UT the preferred inspection method:

- Automated core spray inspection tooling, specifically designed for the internal core spray piping is now available. In one recent case this equipment performed a CSL examination in three days. This inspection tooling also permits other RPV work activities to be performed in parallel with core spray piping inspections (equipment can operate independent of the refueling bridge).
- UT inspection for the hidden P9 weld which "sees through the collar" has been qualified to the BWRVIP requirements in 1998.

556

FIGURE - 11

584

080

983

2

1. ☐ Yes
 2. ☐ No
 3. ☐ Not sure
 4. ☐ Don't know
 5. ☐ Other

7

1

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- ## •Methods

Repair

- ## •Methods

Back to AM Home Page

WELD ID	LOCATION	INSPECTION METHOD	LOCATION / AZIMUTH
P1	Thermal sleeve to T-box (field weld with a creviced root)	BWRVIP-18	5°, 185°
P2	T-box plug to T-box (field weld with a creviced root)	Unit 1 not required or accessible because of T-Box repair clamp.	5°, 185°
P3	Pipe to T-box (field weld, unfavorable weld geometry, installation cold spring likely)	Unit 1 not required or accessible because of T-Box repair clamp.	5°, 185°
P4a, b, c, d	Elbow to pipe welds (P4c & P4c shop, other field)	BWRVIP-18	81°, 289°, 109°, 261°
NA	Core spray clamp tack welds (Figure 1-5)	BWRVIP-18	65°, 125°, 245°, 305°
P5	Connecting Sleeve to Downcomer Pipe (field weld with a creviced root)	BWRVIP-18	80°, 290°, 110°, 260°
P6	Connecting Sleeve to Riser Coupling (field weld with a creviced root)	BWRVIP-18	80°, 290°, 110°, 260°
P7	Riser Coupling to Riser Pipe (shop weld with a creviced root)	BWRVIP-18	80°, 290°, 110°, 260°
P8a	Collar to Pipe (shop weld, considered a crevice environment)	BWRVIP-18	80°, 290°, 110°, 260°
P8b	Collar to Shroud (shop weld, unfavorable weld geometry, considered a crevice environment)	BWRVIP-18	80°, 290°, 110°, 260°
P9	Core spray line pipe to core spray sparger (shop weld, considered a crevice environment)	BWRVIP-18	80°, 290°, 110°, 260°
NA	Core Spray Pipe Stop	BWRVIP-18	2°, 8°, 182°, 188°

FIGURE-12

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

594 596 598 600 604

Date or Frequency of Inspection	Inspection Method Used	Summarize the Following Information: Inspection Results, Reinspections	Failure Mode/ Location of Degradation	Comments
1994	VT-1 (1 mil)	IEB 80-13/NUREG of piping and welds in annulus. 120 degree indication at P3 weld.	Indication observed during 1994 on P 3 of T-box was permanently repaired in 1996.	
1996	EVT-1, UT	Cracking in 260 deg and 290 deg downcomer elbow to thermal sleeve collar welds on elbow side; 260 deg had 1-4.6" indication and 290 deg had 1-3" and 1-4" adjacent indications; all indications detected by VT and confirmed with UT. [P8a]		
1998	EVT-1, UT	Inspection of all Unit 1 P4d, P8a and P8b welds discovered a new indication on the 110° P4d weld. The new indication is 2.98" between 130° and 180° on elbow side of weld.		

590



FIGURE - 13

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

Mitigation Method	Welds Mitigated	Status	Plant Implemented
Hydrogen Water Chemistry	None of the core spray internal piping welds or the core spray nozzle thermal sleeve welds are protected by feedwater hydrogen injection. It is not practical to protect these welds with an increased hydrogen level.	Developed / Implemented	Implemented at Dresden 2 & 3 to protect piping and lower plenum internals.
Noble metal chemical addition NobleChem™ in combination with hydrogen injection	Even noble metal chemical addition in combination will not afford adequate protection to the susceptible core spray internal piping welds.	Developed / Implemented	Implementation at Dresden 2.
Noble metal coating	Theoretically possible to protect some of the core spray welds. However, the configuration of and access to core spray internal piping welds would make noble metal coating of limited practical value. To be fully effective both sides of the relatively thin core spray welds would require coating application.	Developed / Implementation in process at this time	Being implemented on the ID of foreign 2 shroud H3 and H4 welds at this time.
Noble metal cladding	Theoretically possible to protect some of the core spray welds. However, the configuration of and access to core spray internal piping welds would make noble metal cladding of limited practical value. To be fully effective both sides of the relatively thin core spray welds would require cladding.	Developed / Implementation in process at this time	Being implemented on the ID of foreign incore monitor housings welds at this time.

610

FIGURE - 14

Core Spray Internal Piping

Background

- Configuration Drawings
- Susceptibility

Field History

- BWR Fleet

Inspection

- Inspection Tools
- Baseline Inspection
- Inspection Experience

Mitigation

- Methods

Repair

- Methods

Back to AM Home Page

Repair Method	Weld Repaired	Status	Plant Implemented
Welded repair clamps	P3 pipe to T-box and individual elbow to pipe welds	Developed / Implemented	Several (not a permanent repair)
Local mechanical repair clamps		Developed / Implemented	Dresden and others (not a permanent repair)
Lower sectional replacement		Developed / Implemented	One core spray downcomer at Browns Ferry 3
Full core spray line replacement	All	Some development required	Several BWRs currently pursuing, but no BWR has yet implemented

630



FIGURE - 15

